THAT WHICH IS CLAIMED:

1. A method of heating a fiber tape for forming a composite article, the method comprising:

providing a feedforward response surface that defines a plurality of data points, wherein each data point correlates a predefined velocity of the fiber tape, a predefined feedforward control value, and a resulting temperature of the fiber tape;

measuring a temperature of the fiber tape;

determining a velocity of the fiber tape;

determining a feedback control value based on the temperature of the fiber tape and a target temperature of the fiber tape;

determining a feedforward control value based on the target temperature of the fiber tape and the velocity of the fiber tape and according to the feedforward response surface;

determining a heat control value based on the feedback control value and the feedforward control value; and

heating the fiber tape based on the heat control value.

2. The method of heating a fiber tape of Claim 1 wherein providing a feedforward response surface comprises constructing a feedforward data table of data points, each data point correlating a predefined velocity of the fiber tape, a predefined feedforward control value, and a resulting temperature of the fiber tape, and wherein determining a feedforward control value comprises retrieving a value from the feedforward data table based upon the target temperature and the velocity of the fiber tape.

3. The method of heating a fiber tape of Claim 2 wherein the constructing step comprises:

operating a fiber placement machine at the predefined velocity of the fiber tape;

providing the predefined feedforward control value as a heat control value;

measuring the resulting temperature of the fiber tape;

storing the predefined velocity, the predefined feedforward control value, and the resulting temperature as a data point in the table of data points.

4. The method of heating a fiber tape of Claim 2 wherein the constructing step comprises:

calculating the resulting temperature based on the predefined velocity of the fiber tape and the predefined feedforward control value; and

storing the predefined velocity, the predefined feedforward control value, and the resulting temperature as a data point in the table of data points.

5. The method of heating a fiber tape of Claim 1 wherein the constructing step comprises mathematically defining a correlation between the predefined velocity, the predefined feedforward control value, and the resulting temperature of the fiber tape.

6. The method of heating a fiber tape of Claim 5 wherein determining a feedforward control value comprises mathematically defining the feedforward control value according to the feedforward response surface and based on the target temperature and the velocity of the fiber tape.

7. The method of heating a fiber tape of Claim 6 wherein determining the feedforward control value comprises mathematically defining the feedforward control value as:

$$FCV(t) = B_0 + B_V * V + B_T * T + B_{VT} * V * T + B_{TT} * T^2$$

wherein FCV(t) is the feedforward control value as a function of time, T is the target temperature, V is the velocity of the fiber tape, and B_0, B_V, B_T, B_{VT}, and B_{TT} are predefined coefficients.

8. The method of heating a fiber tape of Claim 1 further including setting the target temperature of the fiber tape.

9. The method of heating a fiber tape of Claim 1 wherein said step determining a velocity of the fiber tape comprises measuring the velocity of the fiber tape.

10. The method of heating a fiber tape of Claim 1 further comprising setting a target velocity of the fiber tape and wherein determining a velocity of the fiber tape comprises determining the velocity of the fiber tape based on the target velocity of the fiber tape.

11. The method of heating a fiber tape of Claim 1 wherein determining a feedback control value comprises determining the feedback control value utilizing proportional-integral-differential control.

12. The method of heating a fiber tape of Claim 1 wherein determining a heat control value comprises summing the feedback control value and the feedforward control value.

13. A method of forming a composite article from a fiber tape, the method comprising:

providing a feedforward response surface that defines a plurality of data points, wherein each data point correlates a predefined velocity of the fiber tape, a predefined feedforward control value, and a resulting temperature of the fiber tape;

irradiating the fiber tape with a laser diode array;

compacting the irradiated fiber tape against a workpiece such that the fiber tape conforms to the contour of the workpiece and is adhered thereto;

measuring a temperature of the fiber tape;

determining a velocity of the fiber tape;

determining a feedback control value based on the temperature of the fiber tape and a target temperature of the fiber tape;

determining a feedforward control value based on the target temperature of the fiber tape and the velocity of the fiber tape and according to the feedforward response surface;

determining a heat control value based on the feedback control value and the feedforward control value; and

heating the fiber tape based on the heat control value.

14. The method of forming a composite article of Claim 13 wherein providing a feedforward response surface comprises constructing a feedforward data table of data points, each data point correlating a predefined velocity of the fiber tape, a predefined feedforward control value, and a resulting temperature of the fiber tape, and wherein determining a feedforward control value comprises retrieving a value from the feedforward data table based upon the target temperature and the velocity of the fiber tape.

15. The method of forming a composite article of Claim 13 wherein the constructing step comprises:

operating a fiber placement machine at the predefined velocity of the fiber tape;

providing the predefined feedforward control value as a heat control value;

measuring the resulting temperature of the fiber tape;

storing the predefined velocity, the predefined feedforward control value, and the resulting temperature as a data point in the table of data points.

16. The method of forming a composite article of Claim 13 wherein the constructing step comprises:

calculating the resulting temperature based on the predefined velocity of the fiber tape and the predefined feedforward control value; and

storing the predefined velocity, the test feedforward control value, and the resulting temperature as a data point in the table of data points.

17. The method of forming a composite article of Claim 13 wherein the constructing step comprises mathematically defining a correlation between the predefined velocity, the predefined feedforward control value, and the resulting temperature of the fiber tape.

18. The method of forming a composite article of Claim 17 wherein determining a feedforward control value comprises mathematically defining the feedforward control value according to the feedforward response surface and based upon the target temperature and the velocity of the fiber tape.

19. The method of forming a composite article of Claim 18 wherein determining the feedforward control value comprises mathematically defining the feedforward control value as:

$$FCV(t) = B_0 + B_V * V + B_T * T + B_{VT} * V * T + B_{TT} * T^2$$

wherein FCV(t) is the feedforward control value as a function of time, T is the target temperature, V is the velocity of the fiber tape, and B_0, B_V, B_T, B_{VT}, and B_{TT} are predefined coefficients.

20. The method of forming a composite article of Claim 13 wherein determining a feedback control value comprises determining the feedback control value utilizing proportional-integral-differential control.

21. A computer program product for controlling fiber tape heating during formation of a composite article, the method comprising a computer-readable storage medium having computer-readable program code portions stored therein, the computer readable program code portions comprising:

a first executable portion for providing a feedforward response surface that defines a plurality of data points, wherein each data point correlates a predefined velocity of the fiber tape, a predefined feedforward control value, and a resulting temperature of the fiber tape;

a second executable portion for determining a feedback control value based on a temperature of the fiber tape and a target temperature of the fiber tape;

a third executable portion for determining a feedforward control value based on the target temperature of the fiber tape and a velocity of the fiber tape; and

a fourth executable portion for determining a heat control value based on a combination of both the feedback control value and the feedforward control value for controlling the fiber tape heating.

22. The computer program product according to Claim 21 wherein the first executable portion is further capable of constructing a feedforward data table of data points, each data point correlating a predefined velocity of the fiber tape, a predefined feedforward control value, and a predefined of resulting temperature of the fiber tape, and wherein determining a feedforward control value comprises retrieving a value from the feedforward data table based upon the target temperature and the velocity of the fiber tape.

23. The computer program product according to Claim 21 wherein the first executable portion is further capable of:

operating a fiber placement machine at the predefined velocity of the fiber tape;

providing the predefined feedforward control value as a heat control value;

measuring the resulting temperature of the fiber tape;

storing the predefined velocity, the predefined feedforward control value, and the resulting temperature as a data point in the table of data points.

24. The computer program product according to Claim 21 wherein the first executable portion is further capable of:

calculating the resulting temperature based on the predefined velocity of the fiber tape and the predefined feedforward control value; and

storing the predefined velocity, the predefined feedforward control value, and the resulting temperature as a data point in the table of data points.

25. The computer program product according to Claim 21 wherein the first executable portion is further capable of:

mathematically defining a correlation between the predefined velocity, the predefined feedforward control value, and the resulting temperature of the fiber tape.

26. The computer program product according to Claim 25 wherein the third executable portion is further capable of:

determining a feedforward control value by mathematically defining the feedforward control value according to the feedforward response surface and based upon the target temperature and the velocity of the fiber tape.

27. The computer program product according to Claim 26 wherein the third executable portion is further capable of:

determining the feedforward control value comprises mathematically defining the feedforward control value as:

$$FCV(t) = B_0 + B_V * V + B_T * T + B_{VT} * V * T + B_{TT} * T^2$$

wherein FCV(t) is the feedforward control value as a function of time, T is the target temperature, V is the velocity of the fiber tape, and B_0, B_V, B_T, B_{VT}, and B_{TT} are predefined coefficients.

28. The computer program product according to Claim 21 wherein the second executable portion is further capable of:

determining a feedback control value by determining the feedback control value utilizing proportional-integral-differential control.

29. A system for controlling fiber tape heating during formation of a composite article, the system comprising:

a memory device, for storing a feedforward response surface that defines a plurality of data points, wherein each data point correlates a predefined velocity of the fiber tape, a predefined feedforward control value, and a resulting temperature of the fiber tape;

a feedback controller capable of determining a feedback control value based on a temperature of the fiber tape and a target temperature of the fiber tape;

a feedforward controller capable of determining a feedforward control value based on the target temperature of the fiber tape and a velocity of the fiber tape and according to the feedforward response surface; and

a heating device controller responsive to said feedback controller and said feedforward controller for determining a heat control value based on a combination of both the feedback control value and the feedforward control value for controlling the fiber tape heating.

30. The system for controlling fiber tape heating of Claim 29 wherein said memory device stores a feedforward data table of data points, each data point correlating a predefined velocity of the fiber tape, a predefined feedforward control value, and a predefined resulting temperature of the fiber tape.

31. The system for controlling fiber tape heating of Claim 29 wherein the feedforward controller is further capable of providing the predefined control value as a heat control value, and the memory device is capable of storing the predefined velocity, the predefined feedforward control value, and the resulting temperature as a data point in the table of data points.

32. The system for controlling fiber tape heating of Claim 29 wherein the feedforward controller is further capable of determining the feedforward control value by mathematically defining the feedforward control value according to a feedforward response surface and based upon the target temperature and the velocity of the fiber tape.

33. The system for controlling fiber tape heating of Claim 29 wherein the feedforward controller is further capable of determining the feedforward control value by mathematically defining the feedforward control value as:

$$FCV(t) = B_0 + B_V * V + B_T * T + B_{VT} * V * T + B_{TT} * T^2$$

wherein FCV(t) is the feedforward control value as a function of time, T is the target temperature, V is the velocity of the fiber tape, and B_0, B_V, B_T, B_{VT}, and B_{TT} are predefined coefficients.

34. The system for controlling fiber tape heating of Claim 29 wherein the heating device controller is further capable of determining the heat control value by summing the feedback control value and the feedforward control value.

35. The system for controlling fiber tape heating of Claim 29 wherein the feedback controller determines the feedback control value utilizing proportional-integral-differential control.

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